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Mothers' Mental State Words in Response to Infants' Gestures

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Grace Wybourn

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Mothers' Mental State Words in Response to Infants' Gestures

Student Name: Grace Wybourn

Faculty Supervisor: Janet Olson

Faculty Approval Signature

Department of Communicative Disorders

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AUTHOR: **Grace Wybourn**

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ADVISOR: **Janet Olson**

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ABSTRACT:

The current study will address the question: In response to infants' gestures, do mothers use more mental state words referencing infants' mental states or words referencing their own mental states? The study will also examine whether the reference is dependent on the type of mental state used by the mother; those categories are perception, volition, cognition, and disposition. Through examination of previous research, it is hypothesized that mothers will reference infants' mental states more frequently than their own regardless of the type of mental state (Bretherton & Beeghly, 1982). This question is important because there is evidence that mothers' references to infants' mental states during joint attention episodes are more facilitative or acquiring mental state words than mothers' references to their own mental states (Slaughter, Peterson, & Carpenter, 2008; Taumoepeau & Ruffman, 2006; Taumoepeau & Ruffman, 2006). However, no previous study has examined how mothers choose to reference mental states after infants' gestures that may overtly signal their mental states.

Children's acquisition of mental state words has become a new and widely studied research area. This is an important area of research because as we learn more about how children begin understanding language it will become easier to facilitate their language. This study will explore how mothers might facilitate infants' acquisition of mental state words.

Bretherton and Beeghly (1982) found that infants 2;4, understood and used internal state labels for themselves before they applied them to others. Their research comes from the Internal States Language Questionnaire *(ISLQ),* a questionnaire they designed to analyze infant's use of internal state words. The questionnaire was composed of 73 internal state words and was completed by the parents or guardians. The internal state words were broken down into six different categories: perception, physiology, affect, volition/ability, cognition, and judgment/obligation. Their sample consisted of 30 (15 boys, 15 girls) middle-class mothers and their children. Aside from looking at the children at 2;4, they also performed interviews at 10,13, and 20 months. The questionnaire, ISLQ, was given in two parts (at beginning and end of home visit).

Since the ISLQ was developed it has been used by many other researchers. In a research article by Carlson, Mandell, and Williams (2004), they found a strong correlation between the ISLQ and the MacArthur Communicative Development Inventory: Words and Sentences (MCDI) at 24 months. The MCDI measures an infant's expressive vocabulary so it would be expected that the larger the vocabulary the more mental state words the infant has in its lexicon.

More specifically, Taumopepeau and Ruffman (2006) who studied infants at 15 and 24 months found that mothers' talk about desires related to later infant talk about desires and emotions. Their article states that desire terms are acquired first by infants and they hypothesize

that infants have an easier time making inferences about others' desires rather than their thoughts. Their study was broken up into sections: Time 1 and Time 2. At Time 1 the mothers were instructed to describe pictures to their child and the child's general and mental state vocabulary was assessed via a checklist.. The mothers were given two books which contained a total of 30 photographs. Those books included 18 pictures depicting people and children expressing various emotions and 12 pictures depicting people and animals. At Time 2 children were administered two emotion tasks along with the tasks from Time 1. Their study included 74 caregiver-infant pairs (41 male infants and 33 female infants), 71 mother-infant pairs and 3 father-infant pairs. The mean age of the infants was 14.8 months at Time 1 and 24.2 months at Time 2. They also add that infants can pick up on their parents displaying what they want more easily than what they are thinking. In accordance, their study found that mothers were more likely to comment on their infants' desires rather than their thinking.

In a later article by Taumopepeau and Ruffman (2008) they tried to determine what cues mothers are using to determine the appropriate mental state word to use. They hypothesized that mothers may use an infants' gesture as a cue for the appropriate mental state word to use. This particular study was a continuation of a previous study (Taumoepeau & Ruffman, 2006). The study was broken down into Time 1, Time 2, and Time 3 with 74 caregivers and infants (71 mother-infant pairs and 3 father-infant pairs: 41 infant males and 33 infants females) participating in Time 1 and Time 2, and 72 caregiver and infants (39 infant males and 33 infant females) participating in Time 3. Their mean ages were as follows: Time 1 was 14.8 months, Time 2 was 24.2 months, and Time 3 was 32.8. Their study included a picture book task which mothers were instructed to describe the book to their infants just as they do at home. This picture task was included at Time 1, Time 2, and Time 3 with some variation of the task within

the different stages. Other tasks that were included in their study were the McArthur-Bates Communicative Developmental Inventory: Words and Gesture *(MCDJ),* The Reynell Developmental Language Scale *(RDLS),* Child emotion situation task (task to determine how well the children could discern how a person felt), Child body emotion task (task to determine how well the children could discern how a person felt based on their body position), and the Child emotion situation task and body emotion task (combination of the child emotion situation task and child body emotion task).

Olson and Masur (under review) found that mothers' responded with mental state words to infants' gestures approximately 40% of the time and that the mental state word they used varied based on gesture type. Their study consisted of 24 mothers and infants, 12 boys and 12 girls. Their study described mothers' verbal versus nonverbal responses along with the content of the mothers' verbal responses. The study sought to find potential implications for understanding the relationship between infants' gestural production and their lexical acquisition. However, Olson and Masur (under review) did not code whether or not mothers were referring to their own mental states or their infants' mental states. Currently no study has examined whose mental states mothers choose to reference after infants' gestures.

The current study will address the question: In response to infants' gestures, do mothers use more mental state words referencing infants' mental states or words referencing their own mental states? This question is important because there is some evidence that mothers' references to infants' mental states during joint attention episodes are more facilitative of acquiring mental state words than mothers' references to their own mental states (Slaughter et aI.,2008). Slaughter et at. (2008) used three measures in their study: (a) the frequencies and types of mothers' mental state speech to their infants during a 10 minutes free play interaction

when the infants were 9, 12, and 15 months of age; (b) the duration of episodes of spontaneous joint attentional engagement between the mother and infant during the free play interaction, and (c) infants' responses on structured laboratory tests designed to elicit gaze and point following. In their study they had twenty-four mother-infant pairs (12 boys & 12 girls).

The current study will examine mothers' utterances containing mental state words that follow infants' pointing, reaching and object extension gestures and determine whether the mothers are referencing the infant' mental states, their own mental states (i.e., mother), or both (i.e., infant and mother).

Method

Participants

This study will use an existing data base of twenty- four infants at 13 months and their mothers (twelve girls and twelve boys) that were recruited as part of a larger study (Olson & Masur, under review). Twenty-three of the participants were Anglo-American and the remaining participant was African-American. The average age of the mothers was thirty-one years old with a range of nineteen years old to forty years old. Out of the twenty-four mothers, twenty-three mothers reported living with the infants' fathers. The number of mothers working outside of the home was nineteen out of twenty-four total mothers. Twelve of the twenty-four infants were only children. All of the infants were reported as having a vocabulary size less than sixty-five words as measured by the *MacArthur-Bates Communicative Development Inventory: Words and Gesture (MCDI)* or parent interview and were not yet combing words (Fenson, Marchman, Thal, Reznick, & Bates, 2007). All of the infants were reported to point on the MCDI or were observed to pint and there were no over signs of developmental delay. None of the participants had a family history of learning or language difficulties, and the native language of all of the

participants was English. The study was conducted in a laboratory setting at a university clinic. The infants and mothers interacted in another room while experimenters observed from an adjacent room; all of those interactions were videotaped.

Data Base

Data will be collected by viewing existing video recordings of infants interacting with their mothers (Olson & Masur, under review). All of the sessions were recorded in a laboratory setting at a university clinic. As the infants played, three pairs of stimuli (i.e. communicative temptations) were used to create three distinct communicative contexts: proto-declarative (i.e. commenting), proto-imperative (i.e. requesting), and ambiguous to elicit infants' gestures. Mothers were instructed to interact with their infants during the session as they typically would with a toy set that was provided. The mothers were also instructed to ignore the communicative temptations unless their infants noticed them which at that time they could react to the stimuli. Those stimuli were as follows:

> *Proto-declarative stimuli:* Two communicative temptations were used to prompt proto-declarative communicative contexts. The stimuli were presented at the 6 minute mark in the play sample. Both objects (remote control car and bear) were placed out of reach and lit up or played music intermittently (i.e., on for 3seconds and off for 10 seconds) (Olson & Masur, under review). These stimuli were chosen because research has found that inaccessible, animated toys presented out of reach have been found to elicit proto-declarative gestures from infants (Blake, O'Rourke & Borzellino, 1994; Carpenter, Mastergeorge & Coggins, 1983; Carpenter et al., 1988; Franco & Butterworth, 1996; Liszkowski, Carpenter, Henning, Striano & Tomasello, 2004).

Proto-imperative stimuli: Two communicative temptations were used to prompt infants to gesture for proto-imperative purposes. Two objects (wind-up toy and a toy in a plastic container) were given to the infants that were difficult for them to operate without their mothers' assistance. These stimuli were presented three times at the end of the play sessions (Olson & Masur, under review).

Ambiguous stimuli: Two communicative temptations were used to create communicative contexts where the communicative intent of the infants' gestures could be ambiguous to the mothers (i.e. possibly proto-imperative or proto-declarative). Two (bubbles and a brightly colored ball) objects were placed on a shelf out of the infants' reach. The objects were presented at the 10th and 12th minute marks during the sample and lit up and played music intermittently (i.e., on for 3 seconds and off for 10 seconds). The presentation of the two objects was counterbalanced for order (first or second) and position (right or left) across the various subjects (Olson & Masur, under review).

Procedures

Coding Responses to Infants' Gestures

As part of a previous study infants' gestures and their mothers' responses to the gestures were already coded (Olson and Masur, under review). Infants' gestures that immediately followed all 6 communicative temptations were identified. This coding also included the type of gesture (i.e. pointing, object extension/showing, open-handed reaching, and other hand or body movements). Pointing included extensions of the index finger toward an object and excluded exploratory poking or manipulation. Object extension/showing included movements of the arm in the direction of the mother while holding an object and included instances where the infants

gave objects to mothers. Open-handed reaching was defined as extensions of the arm with the hand open, excluding movements that were actually the first phase of grasping and did not included repeated opening and closing of the hand. There was a forth category that included all other hand or body movements that were considered communicative. Mothers' mental state words that followed these gestures had also been previously coded by Olson and Masur (under review) and placed into four mutually exclusive categories: perception (e.g., *see, hear),* volition (e.g., *want, need),* cognition (e.g., *think, know),* and disposition (e.g., *like, scared).*

Coding Mothers' Mental State References after Gesture

For the current study, mothers' utterances containing mental state words were further coded to identify whose mental state was being referenced. See detailed coding manual/decision tree. Coders first identified if there was a pronoun in the utterance. If the pronoun *you* was present in the utterance, the utterance was coded as I: infant.. (e.g. you see, you want, you need, you know, you like). When the pronoun *I* was present in the utterance, the utterance was coded as M: mother.. (e.g. I see, I want, I need, I know, I like). Utterances that contained references to the mother and infant were coded as B: both. (e.g., we/lets/us want, we/lets/us need, we/lets/us know, we/lets/us like) For utterances that did not include a pronoun, researchers were instructed to reference the master coding performed by Olson and Masur to determine if eye gaze was present toward the infant.. If eye gaze was present the mental state word was determined to be referencing the infant and therefore the utterance was coded as referencing the infant.. If the reference could not be placed in any of the above categories it was placed in a forth category of unknown reference.

Inter rater reliability between two coders was obtained for categorizing mothers' mental state references using Cohen's kappa. Coding reliability was performed and was determined to be 100%.

Results and Hypotheses

The mental state words mothers use after infants' gestures were tallied according to their reference and also categorized by the type of mental state word. Non-parametric statistical tests, Wilcoxon Signed Ranks Tests, were used due to the small subject number.. This study tested the following hypotheses:

1. It is hypothesized that overall, mothers will use mental state words referencing their infants' mental states more often than their own mental states.

To test hypothesis one, a Wilcoxon Signed Ranks Test was used with fifteen of the twenty- four mothers. Only fifteen of the twenty-four mothers were included in this analysis because those mothers used mental state words after infants' gestures. The proportions for the analyses were made by taking the total number of mental state words used by the mother as the denominator and those referencing the mother or the infant as the numerators. The mean number of mental state words referencing the mother was 5% while the mean number of mental state words referencing the infant was 95%. A Wilcoxon Signed Ranks Test showed that these proportions were significantly different (Z= -3.623; p= 0.000). Table 1 provides descriptive statistics for the referent of mothers' mental state words.

Table 1

Means (and Standard Deviations) Jar Proportions of Mothers' Mental State References

	Mother	Infant
Mental State Reference (n= 15)	5%	95%

2. It is also hypothesized that the type (perceptual, volitional, or dispositional) of mental state word will not influence mothers' tendencies to reference their infants' mental states. Mothers will continue to reference their infants' mental states more frequently than their own mental states regardless of the type of mental state word.

To test hypothesis two, a Wilcoxon Signed Ranks Test was used on three of the four categories of mental state words. The means show that the mothers continued to reference their infants' mental states more frequently than they referenced their own mental states, regardless of the type of mental state word. The proportions were created by using the total number of mental state words in that particular category as the denominator. . The numerator was created by using the mental state words referencing the mother or mental state words referencing the infant as the numerator. . The category of cognition was not included because only two mothers used mental state words refereeing their infants in that specific category. In the mental state category of perception, the mean proportion of infant references was 89% and the mean of mother references

was 11%. Nine of the twenty-four mothers were included in the analyses for perceptual mental state words. A Wilcoxon Signed Ranks Test for the perceptual mental state words shows that the proportions were significantly different *(Z=-2.636; p=* 0.008). In the mental state category of volition, mothers referenced their infants' mental state words 100% of the time; therefore referencing their own mental states only 0% of the time. A Wilcoxon Signed Ranks Test for volitional mental state words shows that the proportions were significantly different *(Z= -3.464; p=* 0.001). Twelve of the twenty-four mothers were included in the analysis for volitional mental state words. In the mental state category of disposition, the mothers referenced their infants' mental states 100% of the time; therefore referencing their own mental states only 0% of the time. Five of the twenty-four mothers were included in analyses for dispositional mental state words. A Wilcoxon Signed Ranks Test for the dispositional mental state words shows that the proportions were significantly different *(Z=* -2.236; *p=* 0.025). Table 2 provides descriptive statistics for mothers' mental state word references broken down into three different categories. Those categories of mental state words are as follows: perception, volition, and disposition.

Table 2

Means (and Standard Deviations) for Proportions of Mothers' Mental State References According to Mental State Type

Mental State Label	Infant	Mother
Perception (n= 9)	89%	11%
Volition (n= 12)	100%	0%
Disposition (n= 5)	100%	0%

Discussion

The current study set out to find out if mothers reference their infants' mental states more frequently than they reference their own mental states after infants' gestures at l3 months. More specifically the study also looked at 4 mental state categories (i.e., perception, volition, disposition, and cognition) to determine ifthere was a difference in mothers' references dependent upon the type of mental state word. The study found that mothers overwhelmingly referenced their infants' mental states. It was calculated that the mothers referenced the infants 95% of the time and their own mental states only 5%. This pattern of referencing the infant also continued when the mental state words were separated into the different categories. Therefore

the type of mental state word mothers used did not impact whose mental states mothers referenced. They referenced infants' mental states.

This finding is consistent with those of Slaughter et al. (2008) who found that mothers referenced infants' mental states around 85% of the time. Therefore, the mothers referenced their own mental states approximately 15% of the time. They included twenty-four mothers and infants in their study with an even number of girls and boys. The ages ranged from nine months to fifteen months. This is a similar sample to the current study although the current study found an even more significant difference in the number of mental states referenced towards the mother and those referencing the infant..

The current study shows that mothers reference their infants' mental states more frequently than their own but when they referenced their own mental states it was only seen in one category of mental state words, perception. It was found that mothers referenced the infants' mental states 89% of the time but they referenced their own mental states 11% of the time. Although the majority of mental state words referenced infants' mental states it is interesting that perceptual words were the only words that mothers used when referencing themselves. In their article, Bretherton & Beeghly (1982) state that children begin to talk or refer to their own mental states before they begin talking or understanding someone else's mental states. They found that a majority of mental state words used or understood by the infants, 28 months, in their study were perceptual, volitional, and physiological mental state words. In their study that they found infants, 28 months, to have the least amount of cognitive mental state words. It could be hypothesized that mothers conclude that their infants understand their own perceptions so they begin transferring perceptual words to reference their own states.

If it is in fact correct that mothers are beginning to transfer perceptual mental state words first because those are the mental state words that infants understand first than other conclusions could be made. It could be hypothesized that mothers would follow a certain pattern of referencing mental states based on their infants' acquisition. If that is the case we would expect mothers to reference volitional, dispositional, and lastly cognitive states. Therefore, it could be hypothesized that mothers would next begin referencing mental states in a similar order to that of the infants' development. . This is a topic that could be further researched to continue understanding how mothers' choose which mental state word to use or who they are going to reference.

Future research could be to investigate the infants at older age points to follow the mental state references. It would be interesting to see the progression that mothers would follow as they begin referencing the infants less and begin transferring mental states to others. The study could look at the ages at which mothers are referencing their own mental states alongside the development of mental state awareness in the infants.

The study concluded that mothers overwhelmingly referenced their infants' mental state rather than their own mental states. This conclusion resulted in suggestions for future research but conclusions about not performing research can also be made. The current study looked at mental state words in four different categories but it may be suggested by some to look at those references by gesture type also. The current study concludes that repeating the study by gesture type would show the same results. Therefore future research by gesture type (i.e. point, extension, eye gaze) does not need to be conducted because of the strong findings from this study. It would be hypothesized that the same pattern would be found (i.e. mothers referencing their infants' mental states rather than their own).

The study confirmed the hypotheses but there is still much research needed to be done. This study gave multiple suggestions of potential research that could be done. It is important to understand how mothers determine the appropriate utterance to facilitate their infants' language development. It was hypothesized that mothers would reference their infants' mental states rather than their own and the results supported that conclusion. The study also hypothesized that mothers would continue to reference their infants' mental states regardless of the mental state type. The results also supported this hypothesis.

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Appendix 1

DECISION TREE FOR CODING MOTHERS ' MENTAL STATE REFERENCE (Olson, 2009)

Step 1: ldenti fy responses after a gesture containing a mental state word.

Mental state: responses that include a reference to infants' possible mental states at the time of the gesture such as want, think, need, scared, hear, see, listening, and like (Olson & Masur, under review) These responses will be coded with a 'm ' on 'Master Code' sheets.

Step 2: Does the mother use a pronoun?

Yes No

If yes, write the pronoun on the coding sheet and write 1 of the following 3 codes:

3 Types of Mental State References:

1. Referencing the infant (I): referencing the infants' perceptions, desires, intentions, cognitive processes, or disposition.

   Ex. you see, you want, you need, you know, you like

2. Referencing the mother (M): referencing the mothers' perceptions, desires, intentions, cognitive processes, or disposition.

   Ex. I see, I want, I need, I know, I like

3. Referencing both (B): referencing the mothers and infants' perceptions, desires, intentions, cognitive processes, or disposition.

   Ex. We/LetslUs see, We/LetslUs want, We/Lets/Us need, We/LetslUs know, We/LetslU s like

If no, Continue to Step 3

Step 3: Refer to the 'Master Code Sheet' to indicate whether the mother gazed toward the infant..

Yes No

If present code (I) , if no continue to Step 4

Step 4: A reference could not be determined therefore code as unknown (U)

Appendix 2

Maternal Referencing Coding Sheets

Car	**.Subject #**_____		
time code for gesture and type			
time code for nongestural communicative bid			
time code for response			
mental state word			
check if:			
pronoun used			
gaze towards child			
gesture towards child			
mental state reference			

Bear	**Subject #**_____		
time code for gesture and type			
time code for nongestural communicative bid			
time code for response			
mental state word			
check if:			
pronoun used			
gaze towards child			
gesture towards child			
mental state reference			

Ball	Subject #_____		
time code for gesture and type			
time code for nongestural communicative bid			
time code for response			
mental state word			
check if:			
pronoun used			
gaze towards child			
gesture towards child			
mental state reference			

Bubbles	Subject #_____		
time code for gesture and type			
time code for nongestural communicative bid			
time code for response			
mental state word			
check if:			
pronoun used			
gaze towards child			
gesture towards child			
mental state reference			

Wind-Up	Subject #_____		
time code for gesture and type			
time code for nongestural communicative bid			
time code for response			
mental state word			
check if:			
pronoun used			
gaze towards child			
gesture towards child			
mental state reference			

Container	Subject #_____		
time code for gesture and type			
time code for nongestural communicative bid			
time code for response			
mental state word			
check if:			
pronoun used			
gaze towards child			
gesture towards child			
mental state reference			